

Claims

1. Radar transceiver, containing:

- at least one oscillator, which comprises at least one active circuit element, at least one resonant circuit and at least one component that is applicable for frequency detuning,
- at least one mixer comprising at least one diode and at least one passive circuit element,
- a substrate (SU) with at least two dielectric layers located directly on top of each other, with metallized surfaces being located on top, below and between the dielectric layers,
- one or more individual electronic components (CB) located on the top side of the substrate (SU), which components comprise
 - at least one active or nonlinear circuit component of the mixer and
 - at least one active or nonlinear circuit component of the oscillator

where the at least single passive circuit element of the mixer or the at least single resonant circuit of the oscillator is integrated in the metallized surfaces of the substrate (SU).

25 2. Radar transceiver according to Claim 1,

wherein the oscillator is a voltage-controlled oscillator (VCO).

30 3. Radar transceiver according Claim 1 or 2,

wherein the oscillator comprises a nonlinear circuit element for frequency detuning located on the top side of the substrate.

35 4. Radar transceiver according to Claim 3,

wherein the nonlinear circuit element for frequency detuning is a varactor diode.

40 5. Radar transceiver according to at least one of the

Claims 1 to 4,
wherein the mixer contains a hybrid ring that is integrated in the substrate (SU).

45 6. Radar transceiver according to at least one of the

Claims 1 to 5,
comprising a frequency divider (FD) for dividing the frequency of the output signal of the oscillator.

7. Radar transceiver according to at least one of the
Claims 1 to 6,
comprising a phase-locked loop which is integrated in
5 the circuit of the frequency divider.
8. Radar transceiver according to at least one of the
Claims 1 to 7,
having a terminal on the bottom side of the substrate
10 for connecting an external antenna.
9. Radar transceiver according to at least one of the
Claims 1 to 8,
wherein at least a part of at least one antenna (TX-ANT,
15 RX-ANT) is located on the top side of the substrate or
the bottom side of the substrate.
10. Radar transceiver according to at least one of the
Claims 1 to 9,
20 comprising at least one cover film (SF), which covers
one or more individual electronic components completely
and serves the purpose of protecting one or more individual
electronic components from dust, humidity and me-
chanical effects.
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11. Radar transceiver according to Claim 10,
wherein the cover film is covered by a metal layer.
12. Radar transceiver according to at least one of the
Claims 1 to 11,
30 which is encased by a casting resin.
13. Radar transceiver according to at least one of the
Claims 1 to 12,
35 which contains at least one circuit element (IE) se-
lected from among an inductance, a capacitance, a line
or line termination that is integrated in the substrate
(SU).
- 40 14. Radar transceiver according to at least one of the
Claims 1 to 13,
wherein one or more individual electronic components
(CB) on the top side of the substrate (SU) are selected
from among a microwave chip, a millimeter wave chip or
45 an IC element.

15. Radar transceiver according to Claim 14,
wherein the at least single IC element represents an
MMIC - Monolithic Microwave Integrated Circuit - ele-
ment.

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16. Radar transceiver according to at least one of the
Claims 1 to 15,
wherein the one or more individual electronic components
are mechanically and electrically connected to the sub-
strate (SU) via flip chip technology or SMD technology.

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17. Radar transceiver according to at least one of the
Claims 1 to 16,
comprising one or more individual electronic components
15 (CB), selected from among the following components: a
discrete passive circuit element including a coil, a ca-
pacitor and a resistor, or which presents a compact cir-
cuit block, which contains at least one individual elec-
tronic component selected from among a coil, a capacitor
20 or a resistor, including any combination of said indi-
vidual components.

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18. Radar transceiver according to at least one of the
Claims 1 to 17,
25 wherein the substrate (SU) contains at least two layers
of LTCC or HTCC ceramic - Low Temperature Cofired Ce-
ramic, High Temperature Cofired Ceramic.

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19. Radar transceiver according to at least one of the
Claims 14 to 18,
which contains at least one mixer diode or at least one
35 chip element, which accomplishes a mixer function, and a
IC element, which comprises at least a part of the os-
cillator and the frequency divider (FD).

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20. Radar transceiver according to at least one of the
Claims 14 to 19,
wherein at least a part of the oscillator, the frequency
40 divider (FD) and the mixer is realized in one, two or
three IC elements.

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21. Radar transceiver according to at least one of the
Claims 1 to 20,
wherein frequency modulation takes place by means of
45 frequency keying of an oscillator, an amplifier or a
very high frequency switch.

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22. Radar transceiver according to at least one of the
Claims 1 to 21,
wherein amplitude modulation takes place by means of am-
plitude keying of the oscillator, an amplifier or a very
5 high frequency switch.

23. Radar transceiver according to at least one of the
Claims 13 to 22,
wherein the at least single IC element comprises at
10 least one amplifier in the transmission or reception
path.

24. Radar transceiver according to at least one of the
Claims 1 to 23,
15 which is configured as an LTCC module or as partial mod-
ules that are electrically connected with each other,
where said partial modules are installed by machine us-
ing SMD technology.

20 25. Radar transceiver according to Claim 1,
wherein the substrate (SU) is as a monolithic ceramic
object.

25 26. Radar transceiver according to Claim 1,
wherein the at least single passive circuit element of
the mixer and/or the at least single resonant circuit of
the oscillator is at least partially integrated in one
of the internal metallized surfaces of the substrate
(SU).
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